

DEPARTMENT OF ENERGY
FY 2003 CONGRESSIONAL BUDGET REQUEST
ENERGY EFFICIENCY AND RENEWABLE ENERGY
ENERGY CONSERVATION
(Tabular Dollars in Thousands, Narrative in Whole Dollars)

INDUSTRY SECTOR

PROGRAM MISSION

Mission: The Industrial Technologies program partners with key, energy-intensive industries to develop and apply advanced technologies and practices that reduce energy consumption, improve environmental performance, maintain and create jobs, boost productivity, and significantly improve the competitiveness of the United States.

Strategic Context: Industry is our nation's largest energy-consuming sector, accounting for 39 percent of all U.S. energy use. Moreover, just nine industries (agriculture, aluminum, chemicals, forest products, glass, metal casting, mining, petroleum, and steel) account for 27 percent of national energy use. Collectively, these basic materials processing industries represent the backbone of the U.S. economy, supplying more than 90 percent of the materials needed for our buildings, transportation, communications, and manufacturing sectors. They ship \$1 trillion in products annually, employ three million people, and generate four additional jobs in the economy for each job generated in their industries.

These nine industries hold tremendous opportunities to reduce energy use while increasing productivity and cutting waste. However, they are limited in their ability to invest in the necessary research, development, and deployment (RD&D) by several factors:

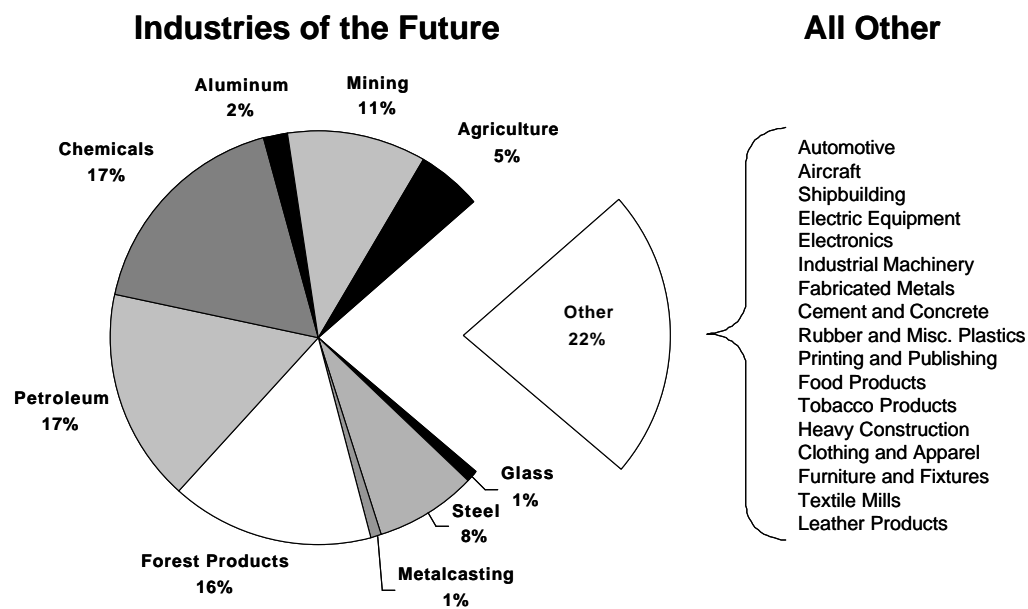
- Narrow profit margins and dependence on capital-intensive equipment
- Increasing competition from foreign firms that receive significant support and market advantages from their governments
- Volatile energy prices (industrial energy prices rose 35 percent or more in 1999-2001) and sporadic energy supply interruptions
- Growing pressure to restrict emissions and effluents

As a result, energy-intensive industries typically invest in RD&D at one-third the rate of the manufacturing sector as a whole.

The National Energy Policy (NEP)^a recognizes that improved energy efficiency in energy-intensive industries can yield large improvements in overall productivity, product quality, safety, and pollution prevention. The NEP specifically recommends “appropriate funding of those research and development programs that are performance-based and are modeled as public-private partnerships.”

Strategic Approach: By developing and adopting more energy-efficient technologies, U.S. industry can boost productivity and competitiveness, strengthen national security, and improve the environment. A collaborative partnership between industry and government provides the best strategy to align national energy objectives with the business interests of industry for mutual benefit. Through an innovative strategy known as “Industries of the Future,” Industrial technologies works with the nine most energy-intensive industries to develop and apply advanced, energy-efficient technologies, processes, and practices. Collectively, these Industries of the Future represent the greatest opportunity to save energy and improve environmental performance in a cost-effective manner. Industrial technologies invests in pre-competitive and high-risk RD&D that individual companies are unable to undertake without government support. Typically, a 50-percent cost-share from industry over the life of the RD&D project is required. By working with entire industries rather than just individual companies, Industrial technologies maximizes the energy benefits of technology investments and fosters the formation of public-private partnerships. Although the Industries of the Future strategy focuses on the nine most energy-intensive industries, it engages the participation and expertise of many related industries.

Figure 1
Energy Use by Industry
Total 2000 End Use: 35.8 Quads*



*Includes 2 quads of renewable energy used principally in the forest products industry.

^aSee National Energy Policy report of the National Energy Policy Development Group (May 2001), p.4-12. “The priority would be to improve the energy intensity of the U.S. economy as measured by the amount of energy required for each dollar of economic productivity. This increased efficiency should be pursued through the combined efforts of industry, consumers, and Federal, state, and local governments.”

The Industries of the Future strategy is based on the view that industry is best qualified to establish its own goals for the future and identify its technology needs and priorities. The strategy features three core components:

1. Industry leaders collaboratively define a vision, develop industry-wide long-term goals, and create technology roadmaps that articulate specific technology and research strategies to achieve the vision.
2. Industrial technologies issues competitive RD&D solicitations in support of the roadmaps, requiring a 50-percent cost-share from industry over the life of each project. Industrial technologies selects projects that address top industry needs, meet strict criteria for government support, and help meet national energy goals.
3. Industrial technologies supports related programs that serve multiple energy-intensive industries by focusing on crosscutting technologies (e.g. sensors and controls), technology demonstrations, energy systems assessments, and technical assistance.

Industrial technologies is expanding its national efforts through its State Industries of the Future initiative. The importance of energy-intensive basic industries to state economies is widely recognized and has given rise to a network of partnerships among state agencies, industry associations, and regional organizations. The Industries of the Future strategy capitalizes on these natural partnerships at the state and regional level to leverage national technology investments; increase energy, economic, and environmental benefits; coordinate state and national activities; and extend its reach to smaller companies. Since each state has a distinctive industrial base, environmental profile, and natural resource mix, the initiative encourages each state to tailor its partnership to meet regional industrial priorities.

The Industries of the Future strategy facilitates industry access to the wealth of technology and specialized expertise available through universities and the DOE laboratories. The industry visions and roadmaps help laboratories and universities better understand, communicate, and provide efficient access to the special capabilities they possess.

Long Term Program Goals and Benefits

The Government Performance and Results Act (GPRA) has been implemented by Industrial technologies through the development of quality metrics projecting the results of individual projects within program planning elements for the Industrial technologies portfolio of projects in a single year. Results are shown in Table 1 for 2005, 2010 and 2020.^a

^aIndustrial technologies produces a report on an annual basis documenting the GPRA process and showing all the assumptions and projects that were included. See, for example, GPRA 2002 Quality Metrics- Methodology and Results: Office of Industrial Technologies, February 28, 2001, 36pp + Appendices. In aggregating the potential savings from successful development of these technologies, engineering judgement is used to avoid double-counting the same savings for different projects. A market penetration model is used for the analysis, and specific program results are critically examined each year.

The performance indicators, listed in Table 2, show^a six measures that are tracked to demonstrate progress towards achieving the potential energy savings listed in the GPRA Table 1 shown above. Trends beginning FY 1996 are shown in the Table 2.

Table 1. GPRA 2003 Projected Program Benefits

Planning Unit	Primary Energy Savings (Btu)		
	2005	2010	2020
Aluminum	17	76	194
Chemicals	96	233	786
Forest Products ^b	32	80	258
Glass	15	31	79
Metal Casting	21	35	75
Steel	30	71	151
Mining	41	76	167
Agriculture ^c	61	189	545
Petroleum Refining	17	36	122
Industrial Materials for the Future	31	74	207
Sensors & Controls	1	9	37
Combustion Systems	16	141	819
Industrial Assessment Centers	14	40	58
Inventions & Innovations	61	112	283
NICE3	21	45	121
Best practices	35	169	438
TOTAL	508	1417	4340

Note: Program benefit projections are developed through an impact analysis process undertaken annually by EERE, based on assumptions for future energy markets derived from EIA's annual energy outlook. EERE's sectors analyze the impacts their programs will have on energy savings, energy cost savings, and carbon reductions if all program goals are met, and future energy markets develop as expected. A sample of program benefit estimates are externally reviewed by Arthur D. Little. An integrated analysis model run by an external contractor controls for interaction effects across programs and sectors.

^aPerformance indicators: Metrics on the number of commercialized technologies and annual energy savings have been tracked by the program for over 20 years. Others such as the number of Allied Partners and Internet Information Page Views track information that can be easily and repeatedly updated. Two new metrics will also be tracked: 1) the number of plants impacted seeks to provide a broad indicator of reach of the overall program in reaching energy intensive plants; and 2) RD&D portfolio turnover is intended to be an indicator of program and portfolio change.

^bForest Products industry energy savings related to black liquor gasification technology are included under Combustion.

^cBenefits of the Agriculture IOF program include large substitutions of biomass feedstock for fossil fuel.

At the sector level, we report a range of estimates that correspond to two modeling cases: with and without program interactions. For example, reductions in new electricity generation requirements due to energy efficiency improvements would reduce the potential market for a range of electricity supply options. When integrated and non-integrated estimates are virtually the same, no estimate range is shown.

Table 2. Performance Indicator Trends^{ab}

	FY96	FY97	FY98	FY99	FY00	FY01	FY02^c	FY03
Number of Commercialized	8	12	9	4	9	10e	10	10
Annual Energy Savings ^d	175	198	218	236	249e	262e	276	290
RD&D Portfolio Turnover of	NA	NA	26	34	25	25e	25	25
Number of New Allied Partners ^e	NA	NA	NA	NA	NA	18	20 ^f	20
Number of Plants Impacted ^g	NA	NA	NA	NA	NA	NA	TBD ^h	2000 ^h
Internet Information Page Views (million)	NA	NA	NA	1.5	3.0	4.6	5.3	6.0

Goals and Performance Measures:

- Between 1990 and 2010, contribute to a 25-percent decrease in energy intensity (as compared to 1991)^h by the nine energy-intensive Industries of the Future (a potential savings of almost 6 quads). By 2020, contribute to a 35-percent decrease in energy intensity (a potential savings of almost 10 quads). See Figure 2.

^a Performance Indicators: the following metrics (number of technologies commercialized, energy savings from Industrial technologies activities in partnership with industry, R&D portfolio turnover of projects, number of new allied partners, number of energy intensive plants impacted by the program, number of internet information page views) quantify the overall success of the Program and are tracked annually as shown in Table 2.

^b *e=estimate*

^c All FY02 numbers are preliminary estimates

^d In trillions of Btu. 1 trillion Btu are worth over \$5 million given recent industrial energy prices.

^e Allied Partner program began in FY01. Industrial technologies partners with companies, industrial and professional associations, non-governmental organizations and universities/colleges, utilities, and equipment manufacturers. The new program includes 12 month agreements that are renewable. Accomplishments under the new program are reviewed annually. An end-of-year report is required each year reviewing what was accomplished under the agreement.

^f A page view is a request made to the Internet server for any content on the site. This does not include graphics.

^g A database is being established to track plants adopting technologies and practices developed with support from Industrial technologies.

^h 15 trillion Btu per billion dollars (\$1992)

- Between 1990 and 2010, commercialize over 100 energy-efficient industrial technologies through RD&D partnerships.

Figure 2. OIT Seeks to Lower Industrial Energy Intensity 1999 to 2020

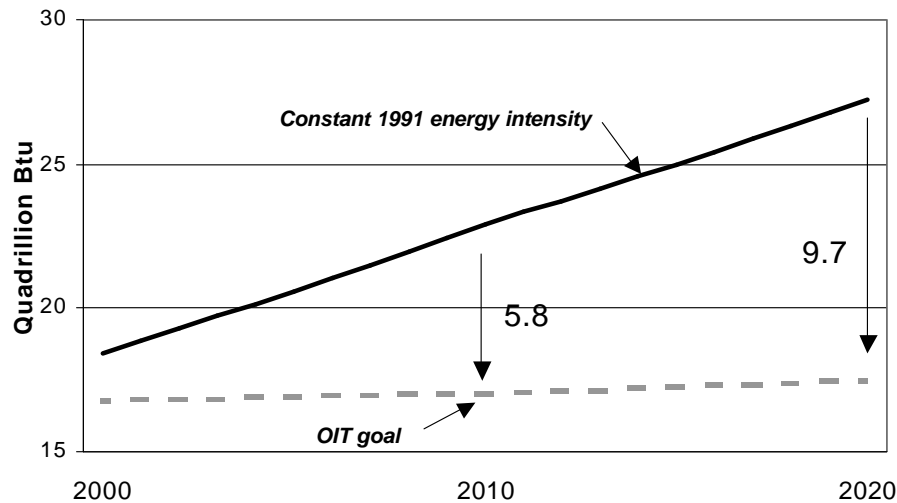


Figure 3. Cumulative OIT Energy Savings

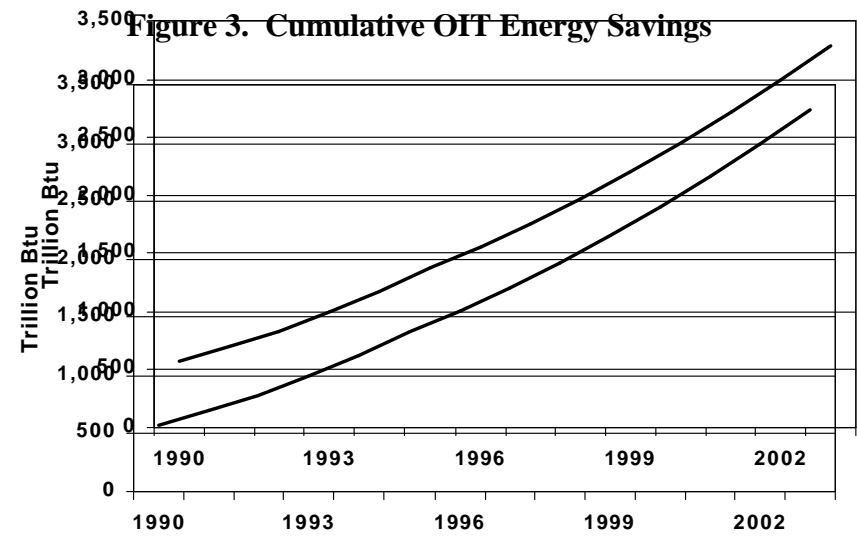
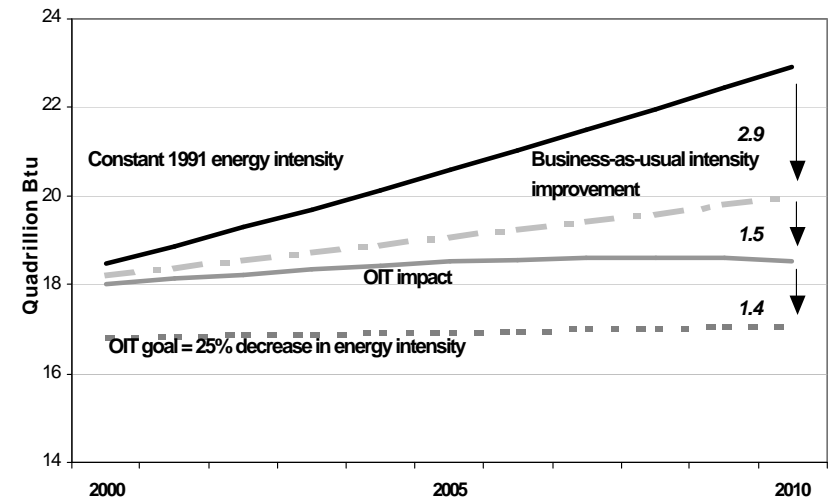


Figure 4. Energy Target Will Require Additional Activity



Benefits: In 2001, Industrial technologies programs directly contributed to industrial energy savings of over 260 trillion Btu — savings worth well over \$1.6 billion.^{a,b} Between 1990 and 2000, Industrial technologies helped develop more than 90 commercialized industrial technologies. Cumulative tracked energy savings from 1990 to 2003 are estimated to be over 3.2 trillion Btu as shown in Figure 3. This success rate is a result of the "industry pull" designed into the Industries of the Future strategy. Industrial technologies currently supports roughly 500 RD&D projects involving over 2,000 partners. Partners include small, medium, and large companies, national laboratories, universities, states, and non-governmental organizations. By concentrating on vital, high-risk RD&D in pre-competitive areas, these diverse partners are collaborating effectively to surmount long-standing technology hurdles and accelerate the pace of technology development.

RD&D projects will continue to produce commercialized technologies that will contribute significantly to increased energy efficiency in energy-intensive industries. As shown in Figure 4, by 2010 our nine partner industries are expected to reduce their energy use by nearly 3 quads through business-as-usual efficiency improvements (EIA projection of .75 percent annually). Concurrently, Industrial technologies-sponsored activities are projected to help these industries lower energy use by an additional 1.5 quads. The remaining gap of 1.4 quads between projected savings and the 2010 goal represents a "stretch" opportunity to further increase energy efficiency and productivity in this core group of industries. Actions that could contribute to this opportunity include more aggressive application of advanced technologies, accelerated commercialization paths of advanced technologies, and public policy incentives for RD&D investment and capital acquisition leading to substantially improved energy efficiency outcomes.

Program Strategic Performance Goals (PSPG)

ER1-7: Specific Vision Industries

Specific Vision Industries R&D activities will develop a portfolio of energy saving technologies and methods that will catalyze reduced energy use in the nine energy-intensive "Industries of the Future" of 329 trillion Btu of annual savings in 2005 827 trillion Btu in 2010, and 2,377 trillion Btu in 2020, compared with the EIA conventional technology baseline..

ER1-8: Crosscutting Industrial Technologies

Crosscutting Industrial Technologies R&D activities will develop a portfolio of crosscutting energy saving technologies, methods, and assistance that will catalyze reduced energy use in energy-intensive "Industries of the Future" of 178 trillion Btu of annual savings in 2005, 590 trillion Btu in 2010, and 1963 trillion Btu in 2020, compared with the EIA conventional technology baseline.

The PSPGs are additive and proportional to their contribution to their activities' individual contributions to the overall goal of the industry

^a Constant 2000 dollar values for energy savings shown in this budget are based upon Energy Information Administration data for 1999 as well as preliminary estimates for 2000 and 2001 and a forecast for 2002. Average industrial energy prices per million Btu in 1999 were \$4.55; \$6.88 in 2000; \$6.30 in 2001 and a forecast of \$5.33 in 2002.

^b Energy savings numbers are based on Industrial technologies FY2003 GPRA analysis.

program.

Annual Performance Results and Targets for ER1-7,8^a

FY 2001 Results	FY 2002 Target	FY 2003 Proposed Target
! In FY 2001, 10 new technologies were commercialized from both the nine vision industries as well as the crosscutting programs. ^b	! Commercialize 10 new energy efficient technologies in partnership with the most energy intensive industries.	! In FY 2003, commercialize 10 new technologies.
! In FY 2001, Industrial technologies helped industry save an estimated 262 trillion Btu of energy worth more than \$1.6 billion. ^c	! Complete 2 showcase demonstrations, at industry sights, of advanced energy efficient technologies.	! In FY 2003, help industry save more than 280 trillion Btu of energy worth at least \$1.5 billion.
! Continued support for Industrial Assessment Centers operating at 26 participating universities that will conduct approximately 650 combined energy, waste and productivity assessments.	! In FY2002, Industrial technologies will complete 20 new Allied Partnerships with energy intensive companies, trade organizations and other groups.	! In FY 2003, project turnover will represent 25% of the FY2002 RD&D project portfolio.
	! Continue support for Industrial Assessment Centers operating at 26 participating universities that will conduct approximately 320 combined energy, waste, and productivity assessment days of service to manufacturing clients.	! FY 2003 Milestone: 2000 energy intensive U.S. plants will apply EERE technologies and services achieving up to a 15% improvement in energy productivity per plant.
	! In FY2002, help industry save more than 265 trillion Btu of energy worth more than \$1.6 billion.	! Industrial technologies internet web sites will record some 6 million page views.
	! Industrial technologies internet web sites will record over 5 million page views.	! In FY 2003, Industrial technologies will complete 20 new Allied Partnerships with energy intensive companies, trade organizations and other groups

^aThe annual performance results and targets shown are part of a coordinated and complementary effort which jointly contribute to the program strategic performance goals

^b To support the development of commercialized technologies solicitations are issued by Industrial technologies. For example, in FY2001 one new solicitation was issued in FY 2001 targeted to the Renewables Vision 2020 for Agriculture in support of the goals of the President's Bio-based Products and Bio-energy initiative. (ER3-3)

^c An important element in industrial energy savings were the energy audits conducted through the continued support for Industrial Assessment Centers as well as the 15 additional assessments and 5 case studies of major industrial plants that will document a variety of system-focused implemented actions were conducted. These assessments influence important replication of similar energy savings for other plants. (ER1-7,8)

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(Dollars in Thousands)

INDUSTRY SECTOR

PROGRAM FUNDING PROFILE

Program Activity	FY 2001 Comparable	FY 2002 Comparable	FY 2003 Request	\$ Change	% Change
Industries of the Future (Specific) Operating Expenses . . .	\$71,831	\$72,624	\$71,615	(\$1,009)	-1.4%
Industries of the Future (Crosscutting) Operating Expenses	\$59,737 ^a	\$60,900	\$57,109	(\$3,791)	-6.2%
Cooperative Programs with States Operating Expenses	\$1,964	\$2,000	\$2,000	\$0	0.0%
Energy Efficiency Science Initiative Operating Expenses . .	\$3,828	\$4,000 ^b	\$0	(\$4,000)	-100.0%
Management and Planning Operating Expenses	\$8,626	\$9,400	\$7,635	(\$1,765)	-18.8%
TOTAL	\$145,986^c	\$148,924	\$138,359	(\$10,565)	-5.8%
Summary					
Operating Expenses	\$145,986	\$148,924	\$138,359	(\$10,565)	-5.8%
Total Program	\$145,986	\$148,924	\$138,359	(\$10,565)	-5.8%

^aComparability adjustment has been made for transfer of multiple projects from Industry sector for Power Technologies.

^bDoes not yet reflect FY 2002, P.L.-107-63 direction that half (\$2,000,000) be made available to the DOE Fossil Energy Research and Development account..

^cReflects adjustment for a reprogramming 01-R-02 reprogramming to Science for SBIR/STTR for \$-2,636,000. Reflects adjustment of \$ -328,000 for Omnibus Rescission, P.L. 106-554.

Staffing (FTEs)	Actual	Budgeted	Budgeted
HQ FTEs	50	54	47
Field FTEs	5	6	7
Total FTEs	55	60	54

Actual Full-Time Equivalent (FTE) usage is cited for FY 2001 while budgeted staffing numbers are displayed in the FY 2002 and FY 2003 columns. For comparability purposes, budgeted FY 2001 FTE were HQ 59, Field 7 and total 66.

Authorizations:

P.L. 102-486, "Energy Policy Act of 1992"

P.L. 94-163, "Energy Policy and Conservation Act" (EPCA) (1975)

P.L. 94-385, "Energy Conservation and Production Act" (ECPA) (1976)

P.L. 95-91, "Department of Energy Organization Act" (1977)

P.L. 95-618, "Energy Tax Act of 1978"

P.L. 95-619, "National Energy Conservation Policy Act" (NECPA) (1978)

P.L. 95-620, "Powerplants and Industrial Fuel Use Act of 1978"

P.L. 96-294, "Energy Security Act" (1980)

P.L. 100-12, "National Appliance Energy Conservation Act of 1987"

P.L. 100-615, "Federal Energy Management Improvement Act of 1988"

P.L. 101-218, "Renewable Energy and Energy Efficiency Technology Competitiveness Act of 1989"

P.L. 101-549, "Clean Air Act Amendments of 1990"

P.L. 101-575, "Solar, Wind, Waste, and Geothermal Power Production Incentives Act of 1990"

P.L. 93-577, "Federal Non-nuclear Energy Research and Development Act of 1974"

P.L. 106-224, "Biomass Research and Development Act of 2000"

DEPARTMENT OF ENERGY
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ENERGY CONSERVATION
(Dollars in Thousands)

INDUSTRY SECTOR

SUMMARY OF CHANGES

	FY 2003 Request
FY 2002 Enacted	\$ 148,924
Non-Discretionary	
- Increase for Federal Pay Raise and Locality Pay	\$ 138
FY 2003 Base	\$ 149,062
<u>Industries of the Future (Specific):</u>	
- Petroleum Refining Vision - No funding requested	\$-2,800
- Agriculture Vision - The increase reflects the needs for education priorities identified in the industry draft bio-based products and bio-energy roadmap.	\$ 1,000
- Technical/Program Management Support - The increase reflects a partial restoration of supporting activities that were reduced in FY 2002.	\$ 791
<u>Industries of the Future (Crosscutting):</u>	
- Industrial Materials for the Future - The decrease reduces the number of new industry R&D projects from 12 to 9.	\$ -1,000
- Combustion - The decrease is for the biomass gasification projects.	\$ -2,791
- Inventions and Innovation - The decrease reduces the number of grants from 20 to 10	\$ -2,000

	<u>FY 2003 Request</u>
– Technical Assistance - Funding will focus on increased on-site plant assessments by the Industrial Assessment Centers and on the replication of energy savings from sites that have previously received technical assistance.	\$ 1,000
– Technical/Program Management Support - The increase reflects a partial restoration of supporting activities that were reduced in FY 2002.. . . .	\$ 1,000
<u>Energy Efficiency Science Initiative</u>	
– No funding requested.	\$ -4,000
<u>Management and Planning:</u>	
– Program Direction - Decrease reflects adjustment in FTE levels	<u>\$ -1,903</u>
FY 2003 Congressional Budget Request	<u><u>\$ 138,359</u></u>